



The Effect of Explicit and Implicit Learning Addition and Multiplication Principles in Algebra by Students with Different Mathematical Metacognitions on Fluency and Mathematical Explanation

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Abstract

In this study, the effects of explicit and implicit learning of addition and multiplication principles in algebra on procedural fluency, representational fluency, and mathematical explanation of students with different mathematical metacognition perceptions were examined. This study, which was conducted according to a nested mixed design, was conducted with 85 secondary school 7th grade students in 2024-2025. As a result of this study; in terms of procedural fluency in addition in algebra; learning process (implicit, explicit, learning activities in the mathematics curriculum), mathematical metacognition perception (high, low), time (pretest, posttest, retention test), binary and triple interactions of these variables; learning process and time effects show significant differences. In procedural fluency in multiplication in algebra, there is a significant difference in the effects of learning process, mathematical metacognition perception and time; in the dual interactions of learning process and mathematical metacognition perception, learning process and time. In representational fluency in addition and multiplication in algebra, there is a significant difference in learning process and time effects; learning process and mathematical metacognition perception, learning process and time binary interactions. In mathematical explanation in addition and multiplication in algebra, there is a significant difference in learning process, mathematical metacognition perception and time effects; learning process and mathematical metacognition perception, learning process and time binary interactions. Students' confidence levels of correct answers regarding the principles of algebra differ significantly in terms of the learning process applied. It was concluded that the experimental groups evaluated the explicit and implicit learning processes and learning materials as supportive.

Keywords: Algebra Learning; Explicit Knowledge; Implicit Knowledge; Secondary School Students; Learning Mathematic